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Public Behavior and Attitudes in Response to Reported Hazardous Drinking Water. A Feasibility Study

Minnesota Univ, Duluth Dept of Sociology and Anthropology

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PUBLIC BEHAVIOR AND ATTITUDES IN RESPONSE TO REPORTED HAZARDOUS DRINKING WATER

A Feasibility Study

by

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When it was learned that Duluth was not a unique situation and that other drinking water supplies also contained asbestiform fibers, it was expected that the provision of specially filtered water might also be done in other cities. At one time it was proposed that bottled water be provided to the residents of Boston because of concern about the lead content of the drinking water. Little is known about the use of such emergency water supply and if the practice is to continue it would seem desirable to measure the public's reaction and use of the water provided. Such information would aid in the provision of the emergency water supply and encouraging the public use of the water provided.

It was not known if valid data could be obtained in this emotionally charged situation and Dr. Robert E. Franz agreed to conducting a study: "Report on feasibility study and pretest of survey of techniques of determining public attitude on use of emergency filtered water in city with reported hazardous drinking water."

This is a report of the feasibility study.

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FOREWORD

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When it was learned that Duluth was not a unique situation and that other drinking water supplies also contained asbestiform fibers, it was expected that the provision of specially filtered water might also be done in other cities. At one time it was proposed that bottled water be provided to the residents of Boston because of concern about the lead content of the drinking water. Little is known about the use of such emergency water supply and if the practice is to continue it would seem desirable to measure the public's reaction and use of the water provided. Such information would aid in the provision of the emergency water supply and encouraging the public use of the water provided.

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INTRODUCTION

This report is of a "feasibility study and pretest of survey techniques for determining public attitudes on use of emergency filtered water in cities with reported hazardous drinking water."[1] The study was conducted during the summer and fall of 1975 in Duluth, Minnesota where the water supply is allegedly hazardous due to the presence of abestiform material[2] in Lake Superior. Procedures to answer two general questions were developed and tested:

1. What is the incidence of the three most likely responses to the reported threat from asbestos in the water supply:
   a. The use of filtered or uncontaminated water from outside the home. Most commonly this would mean using filtered water available from Duluth fire stations and other locations in the city or using well or bottled water.
   b. The purchase of a home filter for removing asbestos material.
   c. The continued use of the non-filtered municipal water.
2. What personal and social factors affect the responses of Duluth citizens to the alleged threat to their health?

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[1] Funded by the Environmental Protection Agency under Order No. 5-03-4497-J.

[2] The term "asbestos" is generally used throughout this report since this is the common usage among the people of Duluth. Technical reports generally refer to the hazardous substance in Lake Superior as "amphibole fibers" or "asbestiform material."

SECTION I: RESEARCH PROCEDURE

This section briefly summarizes the structure of this feasibility study. While the research activities are listed in "stages," many were occurring concurrently.

1. Conceptual Orientation: Although much of the good research on peoples' responses to "crises" created by pollution threats is relatively recent, there is an extensive literature on response to other types of threats. There also exists material on psychological coping strategies, on the relation between attitudes and behavior, and on persuasion and other techniques which can be used to influence behavior which is pertinent to the issue of this study. This literature was reviewed to provide a theoretical base for the present investigation and to aid in identifying relevant issues. This conceptual orientation is discussed more fully in Section II.

2. Familiarity With Duluth Situation: Considerable information was obtained on the history of responses to the disclosure of the presence of abestiform material in Lake Superior. This was done to locate possible sources of usable information (e.g., data already collected) and to provide one basis for questionnaire items. Among the prominent activities were: checking newspapers and other information sources to establish important dates, people, and issues involved in the "asbestos controversy;" interviews with local public officials and others (e.g., the medical community) who have been connected with the issue of filter use; interviews with re-

tailers of home filters; and interviews with proprietors of businesses (e.g., restaurants) which use filtered water.

Much of the information collected at this point merely provided background material and has not been put into reportable format. In general, no attempt was made to sample people on any random basis. Respondents were selected who it was anticipated would provide the most useful information.

3. Interviewing At Fire Stations: It was necessary to determine the incidence of three types of behavioral responses to the alleged threat from Lake Superior water: (a) no change in water consumption patterns, (b) the installation of a home filter, and (c) the use of filtered or uncontaminated water from outside the home. The first activity undertaken was the development of possible procedures for determining the number of people in the latter category above.

Although there are other sources of uncontaminated water, it was assumed that the large majority of people using filtered water from outside their own homes would obtain this water from one of the fire stations in Duluth (filters were installed at these locations beginning in January, 1974). Thus, these stations were monitored and a sample of people obtaining water was interviewed to determine: (a) an initial estimate of the number of people utilizing this water source, (b) the pattern of use (e.g., peak times) so that an adequate sampling procedure might be developed to more accurately use this data source, and (c) the characteristics and attitudes of persons using this filtered water. The results obtained from these interviews are discussed in Section III.

4. Questionnaire Development: A questionnaire to determine the behavior and attitudes of Duluth's citizens was constructed since this is the most feasible method of data collection when broad coverage of an area is desired. The questions were developed from the interviews previously described and from existing literature. Pretests on three groups of people were conducted and several revisions in the questionnaire were subsequently made. The pretest process and difficulties with questionnaires of the type employed in this study are discussed in Section V.

5. Sampling Design and Pilot Study: A multi-stage cluster sampling procedure was developed and tested. A pilot study was then conducted to evaluate the entire survey process. The results of this final stage of the feasibility study are discussed in Section VI.

SECTION II: CONCEPTUAL ORIENTATION

The focus of this feasibility study centered on three questions: (1) What have the behavioral responses of Duluth citizens been to the alleged hazard in their drinking water? (2) What personal and social factors relate to differential responses to this threat? (3) What are the perceptions of and attitudes toward the manner in which the "asbestos crisis" is being handled public and private agencies concerned?

Determining the answer to the first question is primarily a sampling and a measurement problem: how to identify a representative subsection of the population and obtain valid measurement of their behavior. The second and third questions, however, raise more critical theoretical issues. These must be addressed if the meaning of the items in the questionnaire and the implications for the practical results of a more complete study can be fully understood.

The "Health Belief Model" developed by Becker, et al, provided the basic conceptual orientation for this study.[1] This model, which is based in social psychological theory and is similar to many other social science models, is directed specifically at understanding preventive health behavior. As is the case with all social science models, the difficulty with the Health Belief Model lies in developing valid indices of the variables and in determining the precise nature of the interaction between them. These would be critical tasks in a more comprehensive study of how and why people respond to threats to their health. The primary utility of the Health Be-

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[1] For a recent discussion of the Health Belief Model, see Becker, M. H. (ed.) "The Health Belief Model and Personal Health Behavior," Health Education Monographs, Vol. 2, No. 4, Winter, 1974.

lief Model for this feasibility study, however, was in identifying potentially important factors to be investigated. Thus, only a brief outline of this model is presented here to highlight the basic orientation of the investigation.

The primary assumption of the Health Belief Model is that an individual's decision to engage in preventive health behavior (in this instance, the use of filtered water) is determined by his perception of the potential rewards relative to the costs involved in such behavior. There potentially are many rewards and costs associated with any behavior and an individual's choice among options available to him is the result of the relative importance he assigns to each of these. For instance, some possible benefits from using filtered water might be the lessened chance of illness, increased "peace of mind," and approval from family and friends. However, possible costs may be the price of a filter, the time and "trouble" in obtaining water from a fire station, and the change in habitual behavior regarding the use of water. The intensity with which a person ranks considerations such as these will determine whether he uses filtered water.

Assuming the validity of the above perspective, the problem is to determine the dominant perceptions of the rewards and costs associated with filtered water use and what factors influence the relative importance given to each. For instance, some rather obvious expectations are that people would be more likely to use filtered water if: (1) they strongly believe in the alleged threat from the present water supply, (2) they have had cancer or have had close friends or relatives who have cancer, (3) their behavior has possible implications for the health of others

such as their children, or (4) they live near a fire station so that filtered water is relatively easy to obtain. The first three expectations presume that the individual will receive relatively high rewards (or avoid high costs) from using filtered water. The final prediction assumes that a barrier (cost) to using filtered water is low.

However, since not everyone with characteristics such as those above actually uses filtered water, there also must be a determination of those factors which counter or deflect the tendency toward preventive health behavior. One set of such factors, as mentioned previously, relates to the costs involved in obtaining filtered water. Other considerations might be the perceived certainty of the threat, the politization and thus the extent of controversy surrounding the water issue, the likelihood of a municipal filtering plant in the near future, and the ease of simply postponing action and thus putting the issue "out of mind." Factors such as these affect the rewards and costs attached to behavior and also may provide "escape routes" for the person who feels he should do something but whose concern is not sufficiently intense to overcome the barriers to using filtered water. Thus, these "escapes" allow him to reduce any anxiety created by using allegedly hazardous water.

For instance, three commonly-heard comments from people in Duluth are: "They really aren't sure the asbestos actually causes cancer." "The whole thing is a big scare campaign by those who want to close Reserve (Mining Company) down." "The city is building a filter plant and another year or two of drinking this water really won't hurt me." To the extent that these are efficacious explanations to oneself and to others, they will reduce the likelihood of using filtered water.

From a practical viewpoint, the above perspective also has implications

for convincing people to use filtered water. A strategy to produce such a change in behavior can have one of two emphasis: (1) Raising the cost of continuing present behavior. This is done commonly by attempting to convince people that their present behavior is dangerous and thus they will receive benefits from adopting new behavior. (2) Reducing the cost of the alternative behavior. This approach involves the lowering of any barriers to behavioral change. Making filtered water easily accessible would be an example of this strategy.

Any effective attempt to alter people's behavior generally utilizes both emphases, but typically one is stressed more than the other. An overemphasis on the first approach normally will not be extremely successful except in the case of a clear, immediate, and personalized threat. When such a clear threat does not exist and when there are effective "escape routes" of the type mentioned above, greater stress will have to be placed upon the second strategy if a large number of people are to be persuaded to change their behavior. Apparently, this latter situation more clearly exists in Duluth.

While this discussion has been brief and simplified, it does illustrate the conceptual orientation of the Health Belief Model. This framework contains a set of specific factors which presumably affect the likelihood of preventive health behavior occurring. These factors, as outlined below, guided the selection of variables considered important for understanding the reactions of Duluth citizens to the pollution of Lake Superior.

(1) Perceived seriousness of the disease. Most people believe that cancer is serious and this was assumed to be the case in this study. Specifically investigated, however, were beliefs about

whether the alleged asbestos link to cancer was valid and whether Lake Superior was contaminated to a serious extent.

(2) Perceived susceptibility to the disease. For a threat to affect an individual's behavior, it must be perceived as having consequences for him personally. This perception was investigated along with a consideration of factors (e.g., a history of cancer in the family) which might influence this belief.

(3) Modifying factors: These are personal and social variables which may influence a person's beliefs about the water issue in specific and also may relate to his more general socio-policical beliefs. In addition, they may affect his perceptions and weighing of the various reward-cost factors associated with alternative behaviors. Among the modifying factors included on the questionnaire were: age, sex, race, occupation, income, education, family composition, residence, reference group influences, knowledge about the asbestos issue, previous contact with cancer, medical history, health care habits, environmental attitudes, and attitudes pertaining to governmental actions.

Cues to action are variables which trigger behavior and are presumably necessary if overt action is to occur. Among these cues may be: news broadcasts and articles, information campaigns, illness of a friend or family member, advice from a physician, and advice or pressure from people imporatnt to the individual (e.g., family members).

(5) Perceived benefits of preventive action. This factor concerns the perceived rewards from using filtered water. For instance, a per-

son's beliefs about the effectiveness of filters, his level of concern for himself and his family, and his orientation to the evaluations of others were considered in this study.

(6) Perceived barriers to preventive action. As previously discussed, this relates to the costs involved in changing water consumption habits. Among the factors which may relate to these perceived barriers are: income, distance from a fire station, age, physical condition.

These six categories of variables guided the construction of the specific items for the questionnaire and are mentioned again in subsequent sections of this report.

SECTION III: FIRE STATION INTERVIEWS

One of the primary sources of filtered water for private citizens is at each of the fire stations in Duluth. Beginning in January, 1974, this source has had consistent, although variable, use. These stations were monitored and a sample of people obtaining water was interviewed over a period of several weeks in the summer and fall. This was done to develop items for possible use on a more extensive questionnaire and to test the feasibility of a more complete investigation of this source of filtered water.

While all eight fire stations in the city were monitored, at only four were a significant number of interviews obtained. Three of these are in the eastern part of the city which is, in general, the area of highest income. These three appear to have the heaviest use with the Lakeside station (in the far eastern section) having the greatest activity.

The stations were monitored during the day and evening including weekends. A count was made of those obtaining water and a brief description (e.g., a woman in her 20's with two children under 5 accompanying her) was recorded. In addition, interviews were obtained from every fourth person.

The interview schedule (see Appendix A) was brief since it was assumed that most people would not be willing to spend much time answering questions in this situation. A summary of the results of these interviews follows. The data from all stations are combined since there were few important differences from station to station.

Table 3-1: Number of People In Household

Number of People	f	%
1	40	19.5
2	79	38.5
3	24	11.7
4	30	14.6
5 and over	32	15.6
Total	205	

Table 3-2: Families With Children Under 18 Years Old

	f	%
No children under 18	137	66.8
Children under 18	68	33.2
Total	205	

Table 3-3: Number of Children Under 18 In Household

Number of Children	f	%
1	12	17.6
2	38	55.9
3 or more	18	26.5
Total	68	

Table 3-4: Age of Adults In Household

Age	f	%
20 - 24	23	6.4
25 - 34	51	14.2
35 - 44	43	12.0
45 - 54	64	17.8
55 - 59	37	10.3
60 - 64	42	11.7
65 and over	99	27.6
Total	359	

Table 3-5: Ages of Children Under 18 In Household

Age	f	%
0 - 4	36	23.4
5 - 9	49	31.8
10 - 14	40	26.0
15 - 17	29	18.8
Total	154	

It should be emphasized that the data obtained from the interviews at the fire stations must be interpreted cautiously. No formalized sampling procedure was used to select stations, time of day, or individuals. Thus, while a few general comments on the results are made, these must be treated as tentative. However, there is little surprising in the data aside from the age of the people obtaining water. Therefore, it is likely that a more complete study might yield similar conclusions.

While all people in Duluth have been urged to use filtered water, the greatest emphasis has been directed at families with young children. Thus, it might be expected that a disproportionate number of people interviewed would be in such families. However, the reverse was the result. Nearly 67% of the people interviewed had no children under 18 years old. While Duluth does have a large proportion of older residents, 52% of the families in the city do have children under 18 years old (1970 U.S. Census). Thus, these results indicate that people obtaining water from fire stations are not typical, at least in family composition, of the Duluth population.

This atypical tendency also is reflected in the ages of those interviewed. One-half of the adults in these families are 55 or older while in Duluth only 38% of the adults are in this age range.

Why there was this apparent disproportionately high number of older people obtaining water from a fire station is unclear. It may be the result of the "sampling" procedure although this tendency held true regardless of the time of day or the fire station where the interviews were held. It also is possible that people with young families are more likely to purchase filters for home use. One likely reason for this result is that older people are more likely to experience health problems and thus have a greater awareness of health issues. Also, people with chronic health problems were especially urged to use filtered water and these types of health problems are more common among older people. This entire area would need further investigation in a more complete study. Also, questions directed to this issue were incorporated in the later stages of this feasibility study.

It is possible that a larger number of younger people are beginning to use filtered water on a consistent basis. During November and December of 1975, there was increased public attention paid to the water issue. Two storms raised the fiber count in the municipal water and more people began to use filtered water. (The same increase followed a March, 1975 storm. Not only do these storms stir up the abestiform material, they also discolor the water because of bank erosion. Thus, people are visibly confronted with their water problem and this increases the chance of some behavior change.)

There also was a spurt of publicity regarding water use. At least one family had been withholding payment of their water bill and this became newsworthy when the city attempted to discontinue their water supply. An increased effort was made to encourage children to bring filtered water home

from school. The City of Duluth began a program of delivery of water to shutins. These and similar events heightened concern about the quality of the water and appeared to increase the number of people purchasing filters and also utilizing filtered water from fire stations.

Table 3-6: Education of Adults In Household

Education	f	%
8th grade or less	30	10.6
9th - 11th grade	26	9.2
High school graduate	108	38.0
Some college	48	16.9
College graduate	44	15.5
Graduate school	28	9.8
Total	284	

Table 3-7: Occupation of Adults In Household

Occupation	f	%
Professional, technical	44	30.6
Manager, official, proprietor	22	15.3
Clerical and kindred	18	12.5
Sales workers	10	6.9
Craftsman, foremen	18	12.5
Operatives	6	4.2
Service workers	14	9.7
Laborers	2	1.4
Student	6	4.2
Unemployed	4	2.8
Total	144	
Housewife	80	
Retired	70	

As with family composition and age, the education and occupation of the people interviewed at the fire stations were not typical. However, in these latter instances, this was not surprising. Eighty percent of the adults interviewed had at least a high school education compared with 58% for Duluth as a whole. This difference is particularly significant since so many respondents were older and generally the level of educational attainment is less for older people.

This greater educational experience is reflected in the disproportionately higher status occupations of the respondents. Nearly 31% (excluding housewives and retired persons) of those interviewed were professional or technical workers and this is almost twice the proportion of such workers in the Duluth population. Those obtaining filtered water also are overrepresented in the managerial, official, and proprietor occupations while they are underrepresented in the other occupational categories.

Preventive health behavior (e.g., yearly physical and dental checkups) is generally more characteristic of people with higher educational attainment and higher status occupations and income. This also appears to be true of those who utilize filtered water. In addition, it can be expected to be true of those who actually purchase filters for their homes.

Table 3-8: Distance of Residence From Fire Station

Distance	f	%
1 - 4 blocks	51	24.9
5 - 8 blocks	44	21.5
9 - 12 blocks	29	14.1
1 - 2 miles	54	26.3
Over 2 miles	27	13.2
Total	205	

It was expected that the nearer a person lives to a fire station, the greater would be the likelihood that he would utilize this source of filtered water. However, the data indicate no clear relationship between distance of residence from the station and water use. While 60% of the respondents lived less than one mile from a station, a relatively large proportion resided between one and two miles away. Of course, travelling distance is not the only factor affecting use of water from fire stations, but it can be expected to be important.

Table 3-9: Length of Time Using Filtered Water From Station

Length of Time	f	%
Less than 4 months	19	9.3
4 - 8 months	90*	43.9
9 - 12 months	38	18.5
More than 12 months	58	28.3
Total	205	

*33 of these 90 people responded specifically: "since the big storm" (in March, 1975).

Although the "water scare" is two years old, nearly 72% of the people have been getting filtered water for less than a year. A significant proportion began using filtered water in the spring of 1975 when there was considerable publicity regarding the increased turbidity of Lake Superior from storms with high winds. As mentioned earlier, these storms also affect the color of the water thus making people more aware of the concern about water quality. In fact, several people interviewed equated the "muddy" color of the water with asbestos.

Table 3-10: Frequency of Obtaining Water From Fire Station

Number of Times	f	%
Less than once a week	6	3.0
Once a week	53	26.8
Twice a week	82	41.4
Three or more times a week	57	28.8
Total	198	

Table 3-11: Amount of Water Taken From Fire Station

Amount	f	%
1 - 2 gallons	21	10.7
3 - 4 gallons	51	25.9
5 - 6 gallons	54	27.4
7 - 8 gallons	25	12.7
9 - 10 gallons	37	18.8
Over 10 gallons	9	4.6
Total	197	

Table 3-12: Use of Water

Use	f	%
Drinking and cooking	167	83.5
Drinking only	28	14.0
Cooking only	5	2.5
Total	200	

Table 3-13: Have Obtained Filtered or Bottled Water Elsewhere

Have Obtained Elsewhere	f	%
Yes	62	30.7
No	140	69.3
Total	202	

Table 3-14: Source of Filtered Water Elsewhere

Source	f	%
WDIO*	21	33.9
Bottled water	30	48.4
Other	11	17.7
Total	62	

*A local television station which provided well water until summer, 1975.

Table 3-15: Know Others Who Get Filtered Water

Know Others	f	%
Yes	159	79.9
No	40	20.1
Total	199	

Table 3-16: Relationship To Others Who Use Filtered Water

Relationship	f	%
Relative	48	30.2
Friend	111	69.8
Total	159	

Table 3-17: Have Friends With Filter In Home

Have Friends With Filters	f	%
Yes	37	18.4
No	164	81.6
Total	201	

Table 3-18: Have Considered Buying Home Filter

Have Considered Buying Filter	f	%
Yes	63	31.3
No	138	68.7
Total	201	

Table 3-19: Reason Home Filter Not Purchased

Reason	f	%
Expense	34	54.0
Filter plant coming soon	11	17.5
Need more information on filter effectiveness	12	19.0
Other	6	9.5
Total	63	

The results in most of these latter tables can be meaningfully interpreted only with reference to responses to the same items by people who do not use filtered water. For instance, it might be argued that people who have close friends or relatives who use filtered water or who have home filters may be more likely to use filtered water themselves. However, the validity of this expectation can be determined only by comparing data such as those in Tables 3-16 and 3-17 with the pattern of responses from persons who continue to use unfiltered water. Thus, questions similar to those asked of people at fire stations have been included on the larger questionnaire so comparisons can be made if a more comprehensive study is conducted. Only then can some of the dynamics of why people elect to use or not to use filtered water be understood.

One somewhat surprising result is the relatively small percentage (31.3%) of people who indicated they had seriously considered buying a filter for their home. Perhaps the availability of a "cheap" alternative minimizes the need to investigate the purchase of a filter.

SECTION IV: INTERVIEWS WITH FILTER SUPPLIERS

Among the background interviews conducted were several with distributors of Nuclepore filters. These filters were the only ones certified as satisfactory for safe removal of asbestiform material.

One reason for these interviews was to explore the feasibility of using business records to obtain the names of people who had purchased filters for home use. This would be more efficient than relying on a sample of the entire Duluth population to yield a significantly large number of people with home filters. While only ten names were actually used in this feasibility study, it does appear that using store records can be used to provide one source of potential subjects for a more comprehensive study. It would have to be supplemented, however, since some retailers were unable or unwilling to provide the names of purchasers of home filters.

Brief summaries of some of these interviews are provided below to indicate the type of information obtained. In addition, one person raised questions about the testing procedure used to determine which filters would be certified as satisfactory for filtering Duluth's water. This question was not explored in this feasibility study, but is mentioned here since several citizens interviewed did wonder why only one brand of filter was certified. There appeared to be some undercurrent of opinion expressing the belief that "politics" rather than concern with the welfare of Duluth's people influences some of the actions of local, state, and Federal officials. Some of this type of feeling is always present regard-

less of the issue involved and no attempt was made to fully assess the extent, significance, and validity of these perceptions. However, items relating to this general concern were included in the larger questionnaire and this is one area which should be explored in a larger study since attitudes of this type may affect the way people respond to the asbestos in their water supply.

Summary of interviews with filter suppliers:

Business: Goldfines
Person interviewed: Erwin Goldfine

Goldfines sold the Nuclapore unit both in-line and countertop for about ten months during 1974. The units sold for $139.49 and the customer provided for installation if necessary.

The age of the customers tended to be in the forties or above. No further information appears to be available on the customers. I was told that Goldfines no longer had records of those transactions.

Goldfines is also the principle stockholder in Northern Drug Co. They shifted these units back and forth between the two companies as needed for sales. For this reason it was difficult for Goldfines to give an accurate number of units sold.

Goldfines discontinued selling these units due to what they felt was a lack of demand on the part of the public.

Business: Northern Drug Company
Person Interviewed: Erwin Lowenstein, President

Northern Drug has sold about 500 units since January, 1974. This includes 300 in-line units and 200 countertop models. Since a number of their units went to schools, businesses, and the Corps of Engineers, Northern Drug was unable to tell how many of the units went for private use.

In March of 1975, however, as a result of the heavy storms, Northern Drug sold about 160 units to private customers. The price of both the countertop and in-line models was $110. with customers providing their own installation. Mr. Lowenstein stated that most of the customers that he was aware of were 40 years and above in age.

Northern Drug discontinued carrying these units because of low and inconsistent sales. People did not appear to be concerned about filtering their water except during stormy periods when the lake was stirred up.

Business: Acquarious Water Service
Person Interviewed: Ray Flaherty, Owner

Mr. Flaherty indicated that he has sold about a dozen Nuclepore units. He sells both countertop and in-line models for $90.00, jacket and filter included, or $125.00 installed. Replacement filters are $44.00 each. Most of these units were sold to people of middle age and above and most were sold during and after the March storm of 1975.

Mr. Flaherty informed me that he services and sells a number of water treatment and filtration devices and is licensed by the state of Wisconsin both as a water treatment specialist and as a plumber. He explained a number of elements involved in water filtration, particularly in the area of sub-micron filtration. The asbestos-like particles found in Lake Superior water are considered to be sub-micron in size.

Mr. Flaherty maintains that there are other companies beside Nuclepore that manufacture filters capable of sub-micron filtration. He mentioned P.T.M. (Paul Trinity Micro) of Countland, N.W., and another unit put out by Mille-pore (address not noted) as a few examples. Mr. Flaherty told me that as soon as the water quality lab announced the intention of testing for suitable water filters, he offered to submit models of all sub-micron filter units that he had and to supply installation services if needed. The water lab declined his offer.

In reading the Water Lab's report of the tests conducted upon various water filters, Mr. Flaherty feels that there are errors that show up in the testing procedures which would lead to erroneous conclusions. In general, he feels that (1) due to mechanical and technical errors in testing, certain units were rejected as ineffective which could have easily passed the requirements, and (2) other sub-micron filtration units currently being manufactured were not even tested. When he attempted to talk to the water lab about this, he was told (according to Mr. Flaherty) that the lab's tests were concluded and that if he wanted further testing or retesting, he could do it at his own expense.

In summary, Mr. Flaherty feels that due to some units not even being tested by the lab as well as procedural and technical errors, only one unit has been cleared by the water lab. This he feels is a public disservice because it implies that there

is only one unit on the market capable of proper filtration. A second factor which concerns him is that the Duluth report is considered to be a guideline for other areas having water filtration problems.

Business: Arrowhead Chemical, Inc.
Person Interviewed: Carl Marion, President

This company has sold Nuclepore units. The countertop model fastens to the end of the faucet while the in-line model is put directly into the plumbing line, usually under the sink.

Arrowhead has been selling these units for approximately:
Countertop model: $69 for jacket or body, $36.41 for filter.
In-line model: $58 for jacket, $36.41 for filter.

Mr. Marion explained that the units are ordered by the case (12 units per case) and that the price Arrowhead pays varies according to the size of the order. The above prices do not include installation charges.

Mr. Marion estimates that his firm has sold approximately 75 in-line and 50 countertop models. By his estimate, 95% of the units sold have been for private use and the majority of the purchasers, over 90%, have been 50 years of age or older.

Arrowhead estimates that their peak sales came just after the March storm of 1975. They had twenty units on hand which were sold within a few days. They also received sixty inquiries about purchasing units. It appeared to Mr. Marion that while a number of people purchased units for their personal safety, some older people bought the units to provide filtered water for visiting children and grandchildren.

Mr. Marion stated that he would be willing to provide the names of the purchasers of the Nuclepore units.

SECTION V: PRETESTING OF QUESTIONNAIRE

A questionnaire which ultimately could be administered to a broad sample of the Duluth population was constructed. Items were based on the conceptual orientation and the background interviews discussed earlier as well as on the experience interviewing at fire stations. This questionnaire was pretested, modified, and then used in the pilot study. The final form of the questionnaire is contained in Appendix B.

A questionnaire is the only really feasible method of collecting the type of data necessary to assess how people perceive and react to the presence of asbestos in their water. However, questionnaires of the type employed here do present difficulties which must be considered when interpreting the data they generate. One problem noted in this feasibility study, as well as commented upon by other persons who have been dealing with the local water issue, is the tendency to obtain an inflated report on the use of filtered water. There is considerable "social pressure" upon people to do something about the water they use. There appears to be the feeling that not to use filtered water indicates lack of concern about one's health and the health of one's family. Thus, there may be embarassment (a "cost" in the terms discussed in Section II) when one is asked whether he uses filtered water. Therefore, he may feel pressure to say he does use filtered water when in fact he does not or does so only on an inconsistent basis. How extensive this tendency is is difficult to determine, but there is little doubt that it does occur. A related problem is that this bias may be more common for certain types of people. For instance, a person with small children may perceive this "social pressure"

more acutely than a single adult. Thus, interpretations of relationships between variables are distorted.

The problem of overreporting has been noted on other surveys of this type. For example, periodic physical and dental examinations are supposedly "norms" for certain segments of the population and some people report on surveys that they conform to these norms when they really do not. Thus, even something apparently as "objective" as behavior can be distorted when measured by self-report on a questionnaire. If possible, it is desirable that these reports by validated by another measure. For instance, a person's saying he has purchased a filter could be checked against store records if these were complete. It would be extremely difficult, however, to validate a person's report of his use of filtered water from a fire station or another source outside the home. Even if practical, such validations usually are costly and often present ethical problems.

The point of this brief discussion is not really to impugn the honesty of respondents, but merely to indicate that the potential for distortion of this type appears to be very real in this particular instance. Thus, it must be taken into account, if possible, when interpreting data.

Another problem characteristic of all social science research is the difficulty of measuring "subjective" factors such as perceptions and attitudes. Questionnaires (even when administered in a relatively flexible interview setting) often impose an artificial structure or pattern of relationships upon an individual's feelings about an issue. The wording and content of the questions asked, especially when combined with a brief answer such as "agree" or "disagree", may crystallize a person's attitudes into a pattern which may not be entirely accurate.

A related difficulty, as mentioned in Section II, is the problem of

measuring the relative meaning of several factors to an individual. It is assumed that a person's decision to use filtered water is based upon his perception of the rewards and costs associated with that behavior and alternative behaviors. However, the meaning or importance attached to the same factor (e.g., the time required to go to a fire station) is variable from person to person. The accurate assessment of these variable meanings is difficult.

Despite these possible limitations, a questionnaire was considered the most practical mode of data collection in this instance. Nonetheless, these problems should be remembered when evaluating the questionnaire.

The questionnaire was pretested on three small groups of people. First, twenty people who had been interviewed at a fire station and had consented to be interviewed again were selected. People were chosen who represented different areas of the city, different age groups, and different family composition. Ten of the respondents were interviewed in their homes using the questionnaire as the interview schedule. Interviewers were instructed to probe for clarification of responses and to ask for explanation of what certain items meant to the respondent. Respondents also were requested to comment on the wording and content of the items. Questionnaires were delivered to the homes of the remaining ten respondents, the purpose explained to them, and a stamped envelope left for return of the questionnaire. These respondents also were asked to write comments on the questions.

The second group used for pretesting was selected on a judgment basis from the entire city. Using the 1970 U.S. Census data on income, age, and family composition, census tracts and then blocks were selected which appeared to offer a cross-section of the population of Duluth. Fifty blocks were

chosen and interviewers instructed to go to the first household on the block. If no one was home or the interview refused, the interviewer went to each household in order on the block until a successful interview was achieved. Again, one-half of the questionnaires were administered in an interview format and one-half left for the respondent to complete privately and return by mail.

These two methods of administration were used as a preliminary test of the relative adequacy of data and return rate each would yield. The more adequate should be the interview since successful completion is virtually assured once the respondent has initially agreed to the interview. Also, there is opportunity for clarification of items and responses. The advantage of leaving the questionnaire is the practical one of reduced cost since a greater number of questionnaires can be "administered" in the same time that interviews are conducted.

In the pretest, one of the thirty-five (ten from the first group and twenty-five from the second) interviews had to be terminated before completion while seven of the thirty-five questionnaires to be completed privately were not returned. The quality of the data also was higher from the interviews, but that may be due partially to the unique character of a pretest where special effort is made to evaluate the questions. These two methods were used again in the pilot study and will be evaluated in Section VI.

The third group used for the pretest consisted of acquaintances of the researcher. Some of these people had purchased filters, some were using water from a fire station, and some were continuing to use unfiltered water. There were twenty-three people in this group and all were interviewed.

It is not really useful to report data from a pretest. The "sample" was small (85) and not representative. Also, some of the items were altered as experience demanded and thus comparable questionnaires were not given to all respondents. However, some brief descriptive information is included below to indicate the type of people included in the pretest.

Table 5-1: Pretest Groups

Group	f	%
Persons previously interviewed at fire station	19	22.4
Persons selected by judgment sample	43	50.6
Acquaintances of researcher	23	27.0
Total	85	

Table 5-2: Type Of Behavioral Response To Asbestos In Water

Type of Response	f	%
Purchased filter for home	9*	10.6
Use bottled water or filtered water from fire station or other source	31*	36.5
Continue to use unfiltered water	45	52.9
Total	85	

*Both these figures may be inflated. Six of the nine who have home filters were acquaintances specifically chosen for that reason. Nineteen of the 31 who use filtered water from a source outside the home were people previously interviewed at fire stations. This type of inflation probably occurs in other tables (e.g., occupation, education) as well. Thus, it must be emphasized that these data are not to be take as necessarily reflecting the situation in Duluth.

Table 5-3: Number Of People In Household

Number of People	f	%
1	17	20.0
2	23	27.1
3	15	17.6
4	21	24.7
5 or more	9	10.6
Total	85	

Table 5-4: Number Of Families With Children Under 18

	f	%
No children under 18	38	44.7
Children under 18	47	55.3

Table 5-5: Education Of Head Of Household

Education	f	%
Less than high school	9	10.6
High school	27	31.8
Some college	12	14.1
College	21	24.7
Graduate degree	16	18.8
Total	85	

Table 5-6: Occupation Of Head Of Household

Occupation	f	%
Professional, technical	22	28.9
Manager, official, proprietor	11	14.5
Clerical and kindred	7	9.2
Sales workers	11	14.5
Craftsmen and foremen	12	15.8
Operatives	4	5.3
Service workers	7	9.2
Laborers	2	2.6
Total	85	
Retired or houswife	9	

Table 5-7: Years Lived In Duluth

Number of Years	f	%
Less than one	3	3.5
1 - 5	27	31.8
6 - 10	22	25.9
Over 10 years	33	38.9
Total	85	

These tables above indicate that the people used to pretest the questionnaire cannot be considered representative of the population of Duluth. Because of the manner in which two of the three groups were selected, there is a disproportionately high number of people with high

educational attainment and thus higher prestige occupations.

The pretest, however, did yield useful information from which the final questionnaire was developed. This questionnaire was then utilized in a more formal way in the pilot study.

SECTION VI: PILOT STUDY

A pilot study is a miniaturized rehearsal of all aspects of an investigation. This includes the sampling design, data collection, and data analysis. A pilot study should be a final check on the feasibility of all parts of the study design and any significant problems should emerge during this process. The pilot study discussed in this section dealt exclusively with the survey of private citizens in Duluth using the questionnaire in Appendix B. Other sources of data (e.g., interviewing people at fire stations, etc.) possibly important for understanding the behavior and attitudes of people were not subjected to a formal pilot study. These are discussed further in the concluding section of this report.

Sampling: The sampling design utilized was a multistage cluster sample with probability proportionate to size. This is a commonly-used probability sampling procedure and it allows for estimation of probable errors in results.

While cluster sampling has the advantage of efficiency, it does present a problem in accuracy when compared with some other probability sampling procedures. Nonetheless, it is one of the most practical processes for the type of study being conducted here.

The "probability proportionate to size" principle uses the method of selecting many clusters with few elements (households in this study) being drawn from each cluster.[1] This approach thus results in the selection of

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[1]For a discussion of this sampling procedure, see Babbie, Earl R. The Practice of Social Research, Wadsworth Publishing Co., 1975. The brief summary of the principles of this approach is essentially drawn from this source.

more clusters, produces representativeness of elements within each cluster, and each element in the population has an equal chance of selection. Babbie (1975) summarizes the process:

> In the first stage of sampling, each cluster is given a chance of selection proportionate to its size (in number of elements). Large clusters have a better chance of selection than small ones. In the second stage of sampling, however, the same number of elements are chosen from each selected cluster. The effect of these two procedures is to equalize the ultimate probabilities of selection of all elements, since elements in large clusters stand a poorer chance of selection within their cluster than those in small clusters. For example, a city block containing 100 households will have 10 times the chance of selection as a block containing only 10 households. However, if both blocks are selected, and the same number of households is selected from each, households on the large block will have only 1/10 the chance of selection of those on the small one. The following formula indicates a given element's probability of selection in a PPS (probability proportionate to size) sample design.

$$\text{Element Probability} = \text{Number of Clusters Selected} \times \frac{\text{Cluster Size}}{\text{Population Size}} \times \frac{\text{Elements Selected per Cluster}}{\text{Cluster Size}}$$

The specific steps involved in designing the sample for this pilot study will not be discussed here. However, the procedure developed provided for the selection of 1500 households (approximately one-twentieth of Duluth households) and began with the selection of blocks throughout the city. In reality, however, only fifty households (with provision for replacement where completed questionnaires were not obtained) were actually selected for the pilot study. This allowed for a test of the sampling method while also providing specific households for the pilot study.

Administration of Questionnaire: As was the practice with the pretest,

the questionnaire was administered in two ways: (1) by interview, and (2) by delivery to the selected household with the respondent completing the questionnaire privately. Twenty-five completed questionnaires were obtained from each method.

As also was true of the pretest, the interview mode of data collection was more satisfactory. The "success rate" was higher and the information obtained was more complete and less difficult to interpret when the data were being prepared for analysis. The interviewers were experienced and skilled and thus were able to achieve a greater amount of more useful information than was found on the self-administered questionnaires.

The only difficulty with the interview method was its cost. The interviews ranged from thirty minutes to two hours with an average completion time of about one hour. On the other hand, more than one questionnaire could be delivered and explained in the same time and the total cost for the self-administered questionnaires was about one-third of the interview cost. This practical consideration of expense becomes important when a large study is contemplated.

No significant problems were encountered during this phase of the pilot study. Interest in water quality is naturally quite high in Duluth and most people were willing to be interviewed and were able to understand the issues being addressed in the questionnaire.

Analysis of Data: The questionnaire responses were coded, keypunched, and analyzed using various procedures available on SPSS (Statistical Package for the Social Sciences) on the Cyber 74 computer at the University of Minnesota. The questionnaire format is standard and no unusual difficulties

were encountered in the analysis. Only four representative tables are included in this report to indicate a typical presentation of survey data. In addition, the percentages for each response for the attitude questions are provided. However, in no way should the brief results presented here be regarded as conclusive.

Table 6-1: Type Of Behavioral Response To Asbestos In Drinking Water By Presence Of Children Under 18 In Household

Type of Response	Children Under 18 In Household	No Children Under 18 In Household	Total
Purchased filter	2 6.4%*	1 5.3%	3 6.0%
Use filtered water from source outside the home	7 22.6	11 57.9	18 36.0
Use unfiltered water	22 71.0	7 36.8	29 58.0
Total	31	19	50

*Percentages for Tables 6-1 through 6-4 are computed on the column totals.

Table 6-2: Type Of Behavioral Response To Asbestos In Drinking Water By Whether A Family Member Has A Chronic Health Problem

Type of Response	Family Member With Health Problem	No Family Member With Health Problem	Total
Purchased filter	1 8.3%	2 5.3%	3 6.0%
Use filtered water from source outside the home	5 41.7	13 34.2	18 36.0
Use unfiltered water	6 50.0	23 60.5	29 58.0
Total	12	38	50

Table 6-3: Type Of Behavioral Response To Asbestos In Drinking Water By Education Of Head Of Household

Type of Response	Less than High School	High School	College	Total
Purchased filter	0	1 3.2%	2 22.2%	3 6.0%
Use filtered water from source outside the home	2 20.0%	12 38.7	4 44.4	18 36.0
Use unfiltered water	8 80.0	18 58.1	3 33.3	29 58.0
Total	10	31	9	50

Table 6-4: Type Of Behavioral Response To Asbestos In Drinking Water By Family Income

Type of Response	Under $10,000	$10,000 - $15,000	$15,000 - $20,000	Over $20,000	Total
Purchased filter	0	1 5.0%	2 14.3%	0	3 6.0%
Use filtered water from source outside the home	3 50.0%	6 30.0	5 35.7	4 40.0%	18 36.0
Use unfiltered water	3 50.0	13 65.0	7 50.0	6 60.0	29 58.0
Total	6	20	14	10	50

THESE FINAL QUESTIONS ARE ABOUT YOUR FEELINGS ON A VARIETY OF ISSUES. THERE ARE NO RIGHT OR WRONG ANSWERS. PEOPLE HAVE DIFFERENT VIEWS AND WE WOULD LIKE TO KNOW YOUR FEELINGS. PLEASE WRITE EXPLANATIONS OF ANY OF YOUR ANSWERS IF YOU WISH.

FOR EACH STATEMENT, CIRCLE THE ANSWER WHICH IS CLOSEST TO YOUR FEELINGS.

SA = STRONGLY AGREE
A = AGREE
NS = NOT SURE
D = DISAGREE
SD = STRONGLY DISAGREE

	Percent (n=50)				
	SA	A	NS	D	SD
1. The asbestos in Lake Superior is a serious health threat.	38	42	8	10	2
2. The City of Duluth is doing about as much as it can to get filtered water to people.	14	24	12	36	14
3. Most of our pollution problems can be solved by technology.	12	40	22	22	4
4. The Water Lab people have overemphasized the danger from asbestos in Lake Superior	10	14	10	44	22
5. The quality of the environment in Duluth is good	28	48	4	12	8
6. Reserve Mining Company is the major polluter of the Lake	26	34	14	18	6
7. The 55 mph speed limit on highways is a good idea	42	30	4	20	4
8. The Federal Government should stay out of our "water problem" and let local people handle things.	8	30	6	40	16
9. The depositing of taconite tailings in Lake Superior doesn't concern me	8	18	10	50	14
10. Duluth has good quality drinking water	10	20	4	26	40
11. Federal courts are not treating business and industry fairly on environmental issues	18	28	16	18	20
12. It is only necessary for people with young children to use filtered water.	12	20	14	30	24
13. Environmental groups like the Izaak Walton League have too much influence on governmental decisions	22	24	8	30	16
14. Scientists aren't sure the asbestos in Lake Superior comes from taconite tailings	18	20	10	26	26
15. If I ever get cancer, scientists probably will have discovered a cure for it	10	28	16	34	12

	Percent (n=50)				
	SA	A	NS	D	SD
16. Filtered water tastes different.	4	12	22	22	40
17. Reserve Mining Company isn't getting a fair deal in all this publicity about our water	22	26	14	14	24
18. I can't really worry about all the things scientists say cause cancer	16	20	8	34	22
19. Scientists don't really know if asbestos in drinking water causes cancer.	28	24	10	14	24
20. Reserve Mining Company should have to pay the cost of providing filtered water for people in this area	24	20	12	30	14
21. Scientists should have the most influence on how the taconite issue is settled.	12	20	20	38	10
22. It is important to recycle papers, bottles, and cans . .	34	40	4	18	4
23. The water issue in Duluth has received more publicity than it's worth.	28	20	10	26	16
24. Industries that pollute the air and water should be fined	24	30	10	26	10
25. People seem to be satisfied living in Duluth	26	28	14	22	10
26. Whether we like it or not, we have to learn to live with a little pollution.	14	36	8	28	14
27. In most cases, we are not permanently harming nature with our factories and cities.	10	20	22	30	18
28. Reserve Mining Company should be stopped from dumping taconite tailings into Lake Superior no matter what happens to employment.	16	36	12	24	12
29. My chances of getting cancer are higher than average . .	12	14	20	30	24
30. It's too inconvenient to go get filtered water	22	24	6	20	28
31. This whole water scare is caused by people who want to close down Reserve Mining Company.	18	14	14	24	30
32. There is too much governmental regulation on recreational activities like hunting and fishing.	12	26	10	30	22
33. I would be willing to pay higher taxes if it would help eliminate pollution	10	28	18	24	20
34. The Minnesota Pollution Control Agency (PCA) should have the right to close factories	16	28	12	20	24

	Percent (n=50)				
	SA	A	NS	D	SD
35. A wide-open debate about Duluth's water quality is good for the community.	20	32	22	12	14
36. I can't afford a water filter for my home.	18	22	4	36	20
37. I get tired of hearing all the time on the news about asbestos in our water.	10	30	8	28	24
38. It won't hurt people to drink unfiltered water another year or so until the city filtering plant is completed	28	14	10	22	26
39. The Federal Government should pay for cleaning up pollution.	20	28	14	18	20
40. Because of the cost of pollution control, we may have to drink water that isn't completely pure.	16	22	12	36	14
41. My friends and I talk quite a bit about the asbestos in the water.	8	20	2	40	30
42. The warnings about the asbestos in the water are probably just another scare tactic.	14	22	14	20	30
43. Politics rather than the health of people seem to be more important in getting something done about our water.	32	34	8	18	8
44. Even with the asbestos, our water is probably safer than in most cities	14	24	10	32	20
45. Only people with health problems need to use filtered water.	10	22	10	30	28

THANK-YOU FOR YOUR COOPERATION IN FILLING OUT THIS QUESTIONNAIRE. IF YOU WOULD LIKE TO WRITE ANY ADDITIONAL COMMENTS, PLEASE USE THE SPACE BELOW AND ON THE OTHER SIDE OF THIS PAGE.

SECTION VII: CONCLUSIONS

The survey design utilized in this feasibility study was selected because it allows the collection of data pertinent to the issue of "public attitudes on use of emergency filtered water in cities with reported hazardous drinking water." Other research designs were considered but were rejected as too costly and/or more relevant for specific theoretical questions pertinent to responses to threatening situations. (Also, the Environmental Protection Agency contract specified "survey techniques.")

Three of these rejected alternatives were a case study, a field experiment, and a laboratory experiment. One significant problem with both the case study and the field experiment, and to some extent with the survey, in the Duluth situation is timing. The presence of asbestos in Lake Superior has been an issue for over two years and it would have been desirable to begin a study at the time the news of the alleged hazard was released. Thus, a longitudinal study of how people reacted to various developments in this situation could have been conducted.

A mailed questionnaire was rejected immediately because this researcher's experiences with mailed questionnaires have not been satisfactory. It is an inexpensive method for achieving broad coverage, but the usually limited and biased return outweighs any practical advantage a mailed questionnaire may have. Of course, interviews have bias problems too, but these can be controlled (not eliminated completely) more easily and the quality of information is higher than with a mailed questionnaire.

The two methods of data collection used in this study already have

been evaluated. The interview was superior to having the questionnaire delivered and left for the respondent to complete and return. However, this latter method is less expensive and does appear feasible even if it is not as desirable as interviews.

The sampling design used is complex, but can be developed on a larger scale with little difficulty. The information to do so is available and the major problem is the time required to accurately determine the proportions necessary to draw the sample.

The most significant difficulty is a measurement one. As has been discussed, measurement of feelings is difficult, and it is relatively simple to criticize any questionnaire attempting to do so. Considerably more refinement of the one used in this study is possible and desirable. There also are other variables which could have been included on this questionnaire, but length had to be a consideration.

However, the questionnaire did appear to work well in the pilot study and the cursory analysis done provided no real surprises. (I usually consider surprising results to be primarily the result of measurement problems and only secondarily the product of conceptual difficulty. Perhaps this is presumptuous, but I feel that the major obstacle the social sciences have yet to overcome is inadequate measurement of variables.)

Any investigation of how Duluth is responding to the asbestos in Lake Superior could focus on many issues. This feasibility study dealt with the behavior and attitudes of the "typical" citizen. It also may prove useful to compare more completely subgroups of the population (for

example, those who bought filters compared with those who did not). A more complete investigation would go beyond the information contained on the questionnaire and this appears to be feasible in certain instances. For example, it appears relatively simple to study more fully those who obtain water from fire stations.

A citizen group formed to expedite a solution to the pollution of Lake Superior also would be a valid focus for investigation. In addition, two rather large areas which would provide valuable information are the legal proceedings pertinent to this issue and the actions of various public officials and agencies (Environmental Protection Agency, Corps of Engineers, State of Minnesota, City of Duluth, etc.).

In summary, the presence of asbestiform material in Lake Superior and the ensuing reaction to this has provided fertile ground for social science (including history, economics, sociology, psychology, and political science) research. It is a subject which should be explored further and it appears entirely feasible to do so.

APPENDIX A

Questionnaire used to interview people obtaining filtered water from Duluth fire stations. See Section III for a discussion of this phase of the feasibility study.

Location _____
Day _____ Time _____
Interviewer _____
Respondent _____

1. How many people live in your home? _____

   Adults: Age Education Occupation

   ____ _____ _____
   _____ _____ _____
   _____ _____ _____

   Children: Ages _____

2. How far do you live from here? _____

3. How long have you been getting filtered water from here? _____

4. How often do you come? _____

5. How much water do you generally get? _____

6. What do you use the water for? _____

7. Have you obtained filtered water from another place or used bottled water or well water? Yes ____ No ____

   If YES, what? _____

   How often? _____

8. Do you know other people who get filtered water from places like this? Yes____ No ____

   If YES, who? _____

9. Do you have any friends who have a filter in their home? Yes____ No____

10. Have you considered buying a filter for your home? Yes____ No____

    If YES, why haven't you purchased one? _____

11. What made you decide to use filtered water? _____

    _____

We will be doing further study on the water situation in Duluth. Would you mind if we contacted you for additional information?

Name and address: _____ _____

APPENDIX B

Questionnaire developed in pretest interviews and used in pilot study. This questionnaire was designed to be used as an interview guide (with the exception of the attitude items which are read and answered by the respondent) and was administered to one-half of the respondents in this manner. The remaining respondents completed the questionnaire themselves without an interviewer present. Generally, this latter procedure worked well because the entire questionnaire was explained when it was delivered to the respondents' homes by a member of the research staff. However, some change in format and type of instructions would be desirable if this questionnaire were to be used on a self-administered basis on a large scale.

See Sections V and VI for a discussion of the questionnaire.

UNIVERSITY OF MINNESOTA
DULUTH

Department of Sociology-Anthropology
361-365 Classroom Building
Duluth, Minnesota, 55812

Dear Duluth Resident:

This questionnaire is part of a preliminary investigation of how Duluthians have reacted to the disclosure that there is asbestos in our water supply. We are interested in what people have done with regard to their water consumption. We also are interested in what people feel should be done about our "water problem."

Naturally, any information you supply to us will be confidential. Only group figures will be reported and no individual responses will be identified.

If you have any questions or would like to discuss the study further, please call or write me. I would be happy to talk with you.

Thank-you very much for your assistance.

Robert E. Franz, Jr.
Assistant Professor
726-7538

1. Please fill in the following information for each person 18 years old and older who lives in this home. Begin with yourself first.
   -- For education, indicate the highest grade in school completed. Also, indicate any professional or technical training (for example, vocational school) an individual has had.
   -- For occupation, indicate the type of work a person has done the longest. If an individual is now retired, please indicate that and also list the occupation and employer he or she had before retirement.

First Name Of Person	Age	Sex	Education	Occupation and Employer
1.		Female ___ Male ___		
2.		Female ___ Male ___		
3.		Female ___ Male ___		
4.		Female ___ Male ___		
5.		Female ___ Male ___		

2. Are there any children under 18 years old who live in this home? Yes _____ No _____

   If YES, please list their ages: _____